

Marine Corps Heavy Helicopter Lift in the 21st Century with the CH-53X

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Subject Area Aviation

Executive Summary

Title: Marine Corps Heavy Helicopter Lift in the 21st Century with the CH-53X

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Thesis: The United States Marine Corps heavy-lift is extremely relevant to its 21st century warfighting plan. Using Expeditionary Maneuver Warfare, Operational Maneuver From the Sea, Ship to Objective Maneuver, and Seabasing, the Marine Corps' future depends a great deal on the capabilities of the CH-53 and the amount of logistical support it can give to the Marine on the ground. The CH-53's modernization is essential to achieving that goal.

Discussion: This study addresses the history and relevance of heavy-lift in the Marine Corps. The history of the CH-53 is long and distinguished. It has evolved from transporting equipment and supplies to transporting Marines to fill a shortfall in medium-lift in the Marine Corps. In the 21st century with the MV-22 becoming operational, the CH-53 will have come full circle back to lifting equipment and supplies. The distance that the equipment needs to be transported and the weight of it will increase considerably from the 20th Century requirements.

This study largely focuses on what the CH-53X will bring to the Marine Corps in the 21st century and how that will integrate with the Marine Corps' future doctrine. This paper examines the new components that will aid in increasing the lift of the CH-53X and the capabilities brought forward by this increase in lift. There is little doubt that the Marine Corps will require an increase in lift capabilities to accommodate its new doctrine.

Conclusions: Based on the research and assessment in this paper, it is evident that the CH-53X will be essential in the 21st century. It will bring a robust logistics capability to the Marine Air Ground Task Force Commander enabling him to ensure his Marines have the proper equipment and supplies to wage this

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country's battles. Heavy-lift will be the cornerstone in the Marine Corps future warfighting plan. Without logistical support a combat force will be unable to continue the fight and will eventually lose the battle. The CH-53X will bring the necessary heavy-lift capabilities to the battlefield.

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Chapter 1 - Introduction

The mission of the CH-53E Super Stallion helicopter has changed from its initial conception as a platform for lifting supplies and heavy equipment to a prime mover of personnel. The lack of lift from the CH-46E has put strains on the CH-53E aircraft to do things it was never designed to do as a primary mission. Instead of lifting artillery, munitions, and supplies it is now relegated to putting combat power ashore in the form of Marines with M-16's. Since the CH-46E has become what the United States Marine Corps (USMC) has come to call a legacy aircraft, the majority of the lift now comes from the four CH-53Es on a Marine Expeditionary Unit (Special Operations Capable), MEU (SOC) deployment.

The CH-53E has a long history and it has accomplished great things in the past 21 years, but the current utilization rate has made the CH-53E as crippled as the aircraft it now performs the duty for. Because it is used in the initial assault waves instead of the follow-on waves, there is a lack of lift for equipment and supplies which are critical to the Marines on the ground during the assault. The commander of Marine forces is now left with a dilemma of being forced to decide between putting troops on the ground or the supplies those troops need to fight.

The USMC vision of the 21st century calls for modernization of its rotary wing fleet out to the 2050 timeframe. There are plans for both the UH-1N and the AH-1W to renew their structural life to zero flight time (known as zeroing out the time on the airframes) as well as a program to make the majority of their parts be interchangeable.

With modernization and commonality of parts, both aircraft will be able to fight on the modern battlefield and conduct missions they are unable to do at this time.

The CH-46E has undergone numerous modifications to its drive train, engines, and rotor system to modernize it from its development during the Vietnam War. First conceived in the late 1950's and finally becoming operational in the mid-1960's, it has been the workhorse of USMC aviation ever since. The CH-46E is not going to receive any more modifications because its airframe is at its terminal phase. The 410 section of the airframe, the section just in front of the aft transmission section, is now the weak link in the aircraft and it is cost prohibitive to replace it or reinforce it.

The Marine Corps has leapt into the 21st century with the procurement of the MV-22B Osprey. This aircraft will double the payload and range of the CH-46E while doing it three times as fast.¹ The Osprey will become the primary medium-lift assault platform delivering Marines to the battlefield. It will take the duties from the legacy CH-46E and in doing so relieve the CH-53E of its current duties of moving Marines in the initial assault wave.

The triad that the Marine Corps has established for its Operational Maneuver From The Sea (OMFTS) is based on the Landing Craft Air Cushioned (LCAC), the Advanced Amphibian Assault Vehicle (AAAV), and the MV-22B Osprey. This triad will enable the Marine Corps to strike at almost any place at any time with a variety of weapon systems - all from the sea. This will also enable the CH-53E to be used for its original primary mission - the primary transport of heavy equipment and supplies during the amphibious assault.

¹ Amy Svitak, "Corps Sticking with Osprey, but Alternatives Loom Ahead," *Marine Corps Times*, 30 September 2002, 12.

The Marine Corps plans to employ Ship To Objective Maneuver (STOM) in conjunction with OMFTS to bypass the beach. If the Marines are continually placed inland as they were in Operation ENDURING FREEDOM, air transport will be their only resupply option. The Marines will need supplies and equipment delivered to them from the onset of the mission until the end of the operation, including the retrograde phase. The MV-22B Osprey will be limited to dual point externals and a weight limit of 10,000 pounds to a distance of 50 nautical miles at sea level.² This will be the max operational weight of the aircraft thus limiting its range. It will be able to carry a lesser load a greater distance, but even a single High Mobility Multiple Wheeled Vehicle (HMMWV) is 5,200 pounds in its lightest version. Moving a single HMMWV to a distance of 100 nautical miles does not greatly help out the Marine commander because the CH-53E can carry two HMMWVs the same distance at the same speed. The MV-22B will be at its maximum performance level to lift the new lightweight howitzer, M777 (155mm), and will not be able to lift the new Medium Tactical Vehicle Replacement (MTVR), also known as a seven ton truck.

This study will address the history of heavy-lift in the Marine Corps and where it is going in the 21st century. First, it will look at the development of the heavy-lift mission and the evolution of the CH-53. It will encompass the three USMC models and how they transitioned to the next bigger lifter. The next section will describe the current mission of helicopter heavy-lift within the Marine Corps which the CH-53E was designed for. This section also will examine the realities of the current usage rate of heavy-lift helicopters in the Marine Corps and how it is hurting the service life of the CH-53E.

² Headquarters Marine Corps Department of Aviation, "MV-22B Osprey," (Washington D.C., no date). <http://hqinet001.hqmc.usmc.mil/avn/aircraft_fact_files/mv22b.htm>, accessed 6 November 2002. Cited hereafter as MV-22 Facts.

Third, this study will give examples of how the Marine Corps has used its heavy-lift helicopters in the past ten years with great success. Finally, we will examine where heavy-lift is going within the Marine Corps and how it will get there with the CH-53X. The study will compare the capabilities of the CH-53E and the CH-53X. The emphasis will be on what the future holds for the heavy-lift mission within the Marine Corps' OMFTS and STOM.

In conclusion, this study will assess whether the heavy-lift mission is still relevant in the Marine Corps and if the capability will be met if the Marine Corps goes ahead with the Service Life Extension Plan (SLEP) for the CH-53E to convert it to the CH-53X. This study will analyze what capabilities will be needed in the MEU (SOC) and in the Marine Expeditionary Brigade (MEB).

The CH-53 will continue to be the heavy-lift helicopter in the Marine Corps in some shape or fashion until 2050 when a joint heavy-lift platform is identified. The missions have been identified in several Marine Corps doctrinal publications and the future is bright for a heavy-lift helicopter that can meet the necessary requirements. Now is the time for vision and devotion of the proper resources to create a helicopter that meets and exceeds the requirements. As the Marine Corps leapt into the 21st century warfighting with the MV-22, so it must with the next heavy-lift helicopter.

Chapter 2 - Development of the CH-53E

CH-53A

The CH-53E comes after a long lineage of work done by its predecessors, the CH-53A and CH-53D. The CH-53A was ordered for service with the Marine Corps in August 1962.³ This was the largest helicopter in development with any of the United States services. The first model was flown on 4 October 1964.⁴ The CH-53A was the first helicopter built from the ground up as a heavy-lift helicopter to lift extreme weights both internally and externally in austere environments. It was a truly outstanding helicopter especially when it came to the size of the troop compartment. The CH-53A was able to carry a jeep and trailer or a 105mm howitzer; it was also capable of transporting 38 Marines. With a cargo capacity of 16,000 pounds, this all-weather capable helicopter gave the Marines valuable mobility in Vietnam and it was primarily utilized for logistics beginning in February 1967.⁵ Later in the same conflict, the United States Air Force (USAF) was using a variant of this model aircraft as a search and rescue vehicle. The CH-53A heavy-lift helicopter became invaluable to the Marines in somewhat the same way the CH-46 did in increased capabilities over the venerable H-34 the Marines used when they first entered Vietnam.

In 1966, the Marine Corps identified a requirement for the retrieval of downed aircraft and movement of heavy essential combat equipment, which exceeded the

³ United States Marine Corps, "Sikorsky CH-53A (H-53A) 'Sea Stallion,' *USMC Research Center*, URL: <<http://www.northfork.net/Vietnam/CH53stats.htm>>, accessed 2 November 2002. Cited hereafter as USMC Sea Stallion.

⁴ USMC Sea Stallion.

⁵ No author, "Sikorsky CH-53A Sea Stallion," *USMC Research Center*, URL: <<http://www.paxmseum.com/ch53/ch53.htm>>, accessed 22 October 2002.

capabilities of available helicopters, to include the CH-53A.⁶ The aircraft could not recover itself because it weighed 7,000 pounds more than its maximum lifting capacity. Plans were therefore made to modify the CH-53A to meet these requirements.

CH-53D

Although the performance of the CH-53A was remarkable during this conflict, over time more improvements were made to make it even more capable. The USMC added auxiliary fuel tanks to increase the aircraft's range and more capable engines were added to enhance its lifting performance. The new aircraft was designated the CH-53D and was the only heavy-lift platform the Marine Corps had until 1983. The CH-53D had twice the range of the CH-53A at 600 nautical miles and could lift approximately 4,000 pounds more than its predecessor.⁷ It was a more reliable and capable aircraft, but still did not meet the requirements set forth by the Navy and Marine Corps.

“The two services wanted an . . . [A]ircraft that could lift 18 tons at sea level on a 90 degree day, hovering in ground effect.”⁸ The Navy then made the decision to investigate the practicality of reengineering significant performance improvements to the H-53 series helicopter in order to meet the Heavy Lift Helicopter requirements of the Navy and Marine Corps.⁹ The CH-53D was a very capable aircraft, but it was clear to many within the Navy and Marine Corps that a more capable aircraft was possible and the stage had been set for the production of the CH-53E. “In May 1983 the CH-53D

⁶ Department of the Navy, *CH-53E Program History*, No date, 1. Cited hereafter as DON, CH-53E History.

⁷ Gallery Books, *American Air Power* (New York, NY: W. H. Smith Publishers Inc, 1990), 133.

⁸ DON, CH-53E History, 1.

⁹ *Ibid*, 1.

would become just another medium-lift helicopter in the Marine Corps inventory with the . . . [F]irst operational deployment of four CH-53Es onboard the USS *Iwo Jima* (LPH-2).”¹⁰

CH-53E

The CH-53E would soon become a reality when specific requirements were written to ensure the Navy and Marine Corps would receive an aircraft to fit their needs. “The requirements set forth in the Specific Operational Requirement (SOR) document . . . [T]he aircraft would be a multi-turbine powered, dual control, all-metal, all-weather helicopter capable of lifting an 18 ton payload at cruise speed of 125 knots.”¹¹ By January 1972 a mission need statement had been produced and it would be filled by the CH-53E. Prototypes of the first CH-53E were flown in 1974 and the first production aircraft was flown in 1980. The production version of this helicopter was delivered to the Fleet Marine Force on June 16, 1981.¹² This version of the H-53 series was designed to transport material and supplies to Marines operating inland from the established beachhead. The SOR made the following capabilities statement:

1. Logistical resupply.
2. Support of construction projects.
3. Tactical movement of combat equipment.
4. Recovery of damaged equipment.
5. Removal of unflyable aircraft.¹³

¹⁰ DON, CH-53E History, 2.

¹¹ Department of the Navy, *Specific Operational Requirement 14-20 Heavy Lift Helicopter*, Document, October 24, 1967, 1. Cited hereafter as DON SOR.

¹² “Sikorsky S-80 (CH-53E) Super Stallion and (MH-65E) Sea Dragon,” *Apocalyptic War machines*, 1 September 2001, USMC *Research Center*, URL: <http://www.warmachines.50g.com/helicopters/ch-53/ch-53e_info.htm>, accessed 22 October 2002. Cited hereafter as Sikorsky S-80.

¹³ DON, CH-53E History, 3.

Capable of lifting 18 tons at sea level, the CH-53E is capable of carrying three quarters of all Marine equipment including the Light Armored Vehicle (LAV), as well as the M198 (155mm) Howitzer. The helicopter was given a robust cargo handling system, which included both internal and external cargo winches, a ramp for easy loading and unloading, and a cargo roller system embedded within the floor system.¹⁴ The mainstays of the cargo system are the single and dual point cargo hooks which are electromechanical in nature and capable of handling 36,000 pounds. With a retractable refueling probe, the helicopter is capable of indefinite range giving it a much needed self deployment capability.

Since the time of its development the CH-53E has had several other capabilities added to it including: a Forward Looking Infrared System (FLIR), an embedded Global Position Satellite navigational system (GPS), and the ARC-210 V/UHF radio sets which include Satellite Communications (SATCOM). After twenty plus years of service the CH-53E has matured in its avionics capabilities, but has received no survivability upgrades. Any survivability upgrades have been minimal at best because of the associated costs and dwindling Department of Defense budgets which made off-the-shelf items a must. The antiquated AN/ALE 39 missile countermeasures set, for infrared missiles, was an add on which came from fixed wing aircraft during the Vietnam War. Later the AN/APR 39 radar warning receiver was added as well. The most recent updates were in 1995 when crashworthy troop seats were put in the cabin and again in 2001 when the Ground Proximity Warning System (GPWS) was installed. The CH-53E has become an outdated and vulnerable aircraft when it comes to self-defense, but even

¹⁴ Sikorsky S-80.

with these shortfalls in survivability it has become the true workhorse of the Marine Corps.

Chapter 3 - Current Heavy-Lift with the CH-53E

Current Situation

The current situation of the USMC concerning heavy-lift is that it is performed by one helicopter - the CH-53. Although this does include the CH-53D by doctrinal publications, it is considered a medium-lift helicopter because of its declining performance parameters. The CH-53D is scheduled to be replaced by the MV-22B and will be officially classified under medium-lift. Currently the CH-53D is stationed only in Hawaii, with unit deployments to Japan.

The CH-53E Super Stallion is currently the most powerful helicopter in the U.S. military. It is the only aircraft that can lift the 155mm howitzer, its crew and ammunition.¹⁵ The Tactics Manual (TACMAN) for the CH-53E states: “The CH-53 mission is to provide assault support of heavy weapons, equipment and supplies during amphibious operations and subsequent missions ashore.”¹⁶ The TACMAN also lists twelve tasks the CH-53E will be responsible for. According to Marine Aviation Weapons and Tactics Squadron One (MAWTS-1): “The mission of the CH-53E is to provide assault transport of heavy weapons, equipment, and supplies during amphibious operations and subsequent operations ashore.”¹⁷ The Aviation Implementation Plan leaves out the movement of troops as a function of the CH-53E, but it addresses the CH-

¹⁵ Craig Bonholtzer and Suzanne Bonholtzer, “Super Stallion: Mission to Afghanistan,” *Rotor & Wing*, March 2002, 6.

¹⁶ Department of the Navy, United States Marine Corps, Deputy Commandant for Aviation, *Aviation Implementation Plan*, (2001), B-5. Cited hereafter as AIP 00-01.

¹⁷ Department of the Navy, Office of the Chief of Naval Operations, *CH-53E Tactical Manual, NWP 3-22.5-CH53, Volume 1*, (NAVAIR A1-H53BE-TAC-000), Washington D.C., 1999, 1-1. Cited hereafter as CH-53E TACMAN.

53E as the bridge to the MV-22B. One can only assume that this means that the CH-53E will have to make up for the shortfalls in Marine medium helicopter lift, the cost of which could be very substantial if overuse shortens the aircraft's lifespan.

The CH-53E is usually deployed as a detachment of four helicopters to a Marine Medium Helicopter (HMM) squadron during a MEU (SOC) deployment as part of a Reinforced Marine Medium Helicopter squadron (HMM (Rein)). Additional assets of the HMM (REIN) include: four AH-1W attack helicopters, three UN-1N utility helicopters, and six AV-8B Harrier jets.¹⁸ This mixture of aircraft makes up the Aviation Combat Element (ACE) in a MEU (SOC).

The ACE is task-organized to conduct air operations, project combat power, and contribute to battlespace dominance in support of the MAGTF's mission by performing some or all of the six functions of Marine aviation: antiair warfare, assault support, electronic warfare, offensive air support, air reconnaissance, and control of aircraft and missiles.¹⁹

"Currently the MEU (SOC) missions are grouped together into four very broad categories of amphibious operations': . . . [D]irect action operations, military operations other than war (MOOTW), and support operations."²⁰ All of these operations will in some way rely upon Marine aviation to help ensure the desired outcome. Amphibious operations will more than likely involve an amphibious assault in a major theater war (MTW) which the aviation element of the MEU will be used heavily in support of maneuver warfare doctrine.

¹⁸ Agostino Von Hassell, *Strike Force U.S. Marine Corps Special Operations* (Charlottesville, Virginia: Howell Press Inc, 1991), 74-75.

¹⁹ Marine Corps Doctrinal Publication (MCDP) 1-0, *Marine Corps Operations*, Washington D.C.: Headquarters United States Marine Corps, 27 September 2001, 3-14, 15.

²⁰ Headquarters Marine Corps Department of Aviation, "MEU Analysis," *2001 CNA Marine Aviation Requirements Study*, 2 December 2002, URL: <<http://hqinet001.hqmc.mil/avn/documents/acplan2002.pdf>>, accessed 11 January 2003. Cited hereafter as HQMCDA MEU.

The CH-46E and CH-53E are responsible for transporting troops, equipment, and supplies for assault support. The CH-46E has the primary mission of combat assault of troops during amphibious operations and subsequent operations ashore.²¹ The CH-53E will provide combat assault of troops (exclusive of initial assault wave infantry) as a secondary function.²² The basis of this doctrine was established around newer aircraft at the time, but both the CH-46E Sea Knight and CH-53E Super Stallion aircraft have become legacy aircraft with diminishing capabilities.

Realities of Heavy-Lift

During the end of the 20th century and the beginning of the 21st century, heavy helicopter lift in the Marine Corps has significantly diminished in terms of capabilities. The average age of the CH-53E is 13 years old and this past year saw the first CH-53E retired after 19 years of service.²³ The current CH-53E can only carry a 7,600 pound load 200 nautical miles when the pressure altitude is 3,000 feet and the temperature is around 91 degrees Fahrenheit. The CH-53E is a very capable aircraft on paper, but is being used frequently in extreme environments which degrade those capabilities. Even lifting the M198 howitzer is a significant challenge in the heat of summer in North Carolina and usually this is done only for familiarization for the pilots and crew. With the exception of the MAWTS-1 courses and Combined Arms Exercises (CAX), Marine forces do not routinely lift a battery of howitzers (six M198s) at the same time. Accomplishing an artillery raid by air in a situation like Iraq would be a significant challenge with the current CH-53E.

²¹ AIP 00-01, B-4.

²² CH-53E TACMAN, 1-1.

²³ Frank Colucci, "Marine Corps Mulling Over Options for Heavy Lift Helos," *National Defense*, 34.

Many Marine Corps artillery battalions will not allow the CH-53E to pick up their equipment for fear of having it dropped by the aircrew and over the past several years the amount of equipment accidentally dropped by the CH-53E has increased significantly.²⁴ The majority of these “drops” have occurred because of the electromechanical release system employed by the helicopter’s external hook system. This system was the best of the 1970’s, but better systems are available. The majority of the external loads carried by the CH-53E during deployments are fuel bladders for Forward Arming and Refueling Points (FARP), ammo, and water trailers. During the 24th MEU (SOC)’s 1997-98 deployment, the CH-53E detachment lifted seven A-4M Skyhawks externally to a bombing range in Israel.²⁵ While lifting aircraft is seldom done, it is still a requirement of the CH-53E.

The CH-53E heavy-lift helicopter is currently the workhorse of all Marine Expeditionary Forces. Over the past 8 to 10 years the CH-53E has moved to the forefront of transporting personnel instead of the CH-46E. The lack of lift and range of the CH-46E has pushed the CH-53E out of its traditional role of moving supplies so it is now being forced to perform both missions. With the current standard lineup of 12 CH-46Es and only 4 CH-53Es available to the MEU commander, the amount of area that can be influenced by organic assets is very limited. Dependent on the environmental conditions, moving troops further than 30-40 nautical miles inland tax the capabilities of the MEU to its limit. As an example, in 1996 each CH-46E could only carry six passengers being evacuated from the U.S. Embassy in Liberia because of weight and range limitations.²⁶

²⁴ Author’s own experience in the Fleet Marine Force during 1993-1998.

²⁵ 24th Marine Expeditionary Unit Fleet Marine Force, *24th Marine Expeditionary Unit (SOC) Cruisebook*, 1998, 5.

²⁶ Author’s own experience during assignment with the 22nd MEU (SOC).

This whole dilemma questions the current Marine Corps doctrine that has been established and new doctrine that is trying to get a foothold. Modernization is slowly taking effect along with Marine aviation transformation. Expeditionary Maneuver Warfare (EMW) is the mainstay of current Marine force structure which relies a great deal around lifting troops a significant distance. The CH-53E is currently the only heliborne asset capable of doing this regularly. Until the MV-22B is operational, the CH-53Es capabilities in speed, range, and payload will continue to make it the MAGTF commander's most flexible asset.

The question most frequently asked is why not put more CH-53Es in a MEU? The answer comes down to a matter of numbers. The East Coast Fleet Marine Forces only have two CH-53E active Marine Heavy Helicopter (HMH) squadrons with 16 aircraft each. The West Coast has four CH-53E active HMH squadrons with 16 aircraft each. The usual MEU deployment calls for four CH-53Es to reinforce a deploying HMM squadron (CH-46) and they are attached for a period of 13 months. Six months after the first four aircraft are detached from their parent squadron, another four aircraft start the process all over again with another HMM squadron. The West Coast also sends an entire CH-53E squadron to Okinawa, Japan for a six month unit deployment. An analysis done for the Marine Corps indicated that they will be short six MV-22 squadrons and three CH-53 squadrons in future operations working with a MEB as a base model.²⁷ This analysis studied how much lift was required to move a Marine Brigade from ship-to-shore and it concluded that there would be a shortfall in helicopter lift due to a lack of helicopter squadrons available.

²⁷ HQMCDA MEU, 13.

As mentioned previously, a deploying MEU normally is assigned a four plane CH-53E detachment for deployment. However because of the increased demand for these assets, a four plane detachment is becoming the exception rather than the rule. A number of times anywhere from six to eight CH-53Es have been assigned to a MEU for 13 months. Such was the case when the 26th MEU (SOC) deployed in 1995 to the Adriatic Sea for operations in Bosnia to uphold the Dayton Peace Accord. The cost of operating like this is formidable in terms of pilot training and manpower lost to the home HMM squadrons. It takes almost a full year for a HMM squadron to become fully proficient again.

Chapter 4 – Exploits of the CH-53E

Somalia 1991

The beginning of modern long range assaults actually started with Operation EAGLE CLAW, when the U. S. launched eight RH-53's over 600 nautical miles into Iran in an attempt to rescue American hostages. Even though this operation ended in disaster at Desert One, it set the stage for other operations in the future. Eleven years later the Marine Corps would be called on again to fly an extreme distance into harm's way to save American lives. In 1990 Somalia was in a state of armed revolt with as many as twelve different clans seeking control and by the beginning of the New Year Mogadishu, the capital of Somalia, was in total chaos. On 1 January 1991, the U.S. Ambassador to Somalia requested military assistance to evacuate the U.S. Embassy and the next day, Operation EASTERN EXIT was initiated.²⁸ The Navy and Marine Corps team put together a Special Purpose Marine Air Ground Task Force (SPMAGTF) to start steaming south from the Persian Gulf to begin the evacuation. This SPMAGTF consisted of two amphibious ships with two squadrons of CH-46's and two CH-53Es.

At 0247 on the morning of 5 January, at a distance of 466 nautical miles from Mogadishu, the USS *Guam* launched the two CH-53Es with a 60-man security force and SEAL team on board. The extreme distance required two aerial refuelings to ensure enough fuel for the return flight to the USS *Guam*. After a little more than a four hour flight, the two CH-53Es landed in the embassy compound as over 100 Somalis on ladders

²⁸ John Pike, "Operation Eastern Exit," 19 January 2002, URL: <http://www.globalsecurity.org/military/ops/eastern_exit.htm>, accessed 22 October 2002. Cited hereafter as Pike, Op Eastern.

were scaling the embassy's walls. After an hour on the ground, the CH-53Es lifted off with 61 evacuees for the 380 mile return flight to the USS *Guam*, with one aerial refueling enroute.²⁹

The CH-46Es did not participate in the initial stages of the Noncombatant Evacuation Operation (NEO) because it wasn't until the following night, after steaming at full speed during the day, did the amphibious ships come within range of the venerable Sea Knight. The CH-46Es completed the extraction of the SEAL team when the ships were within the range of the Sea Knight. The ambassador's call for assistance could have been answered that very same night had the MV-22 Osprey been operational. The elapsed time of approximately 56 hours between the ambassador's call for assistance and the time the CH-53Es touched down in the embassy might be unacceptable in future conflicts. A better suited airframe is required for a mission of this duration and distance.

Less than two years later the Marines would find themselves in Somalia again and the CH-53E would be called upon to perform an operation for which it was designed, recovery of a disabled aircraft. On 22 April 1993, HMM-263 conducted a Tactical Recovery of Aircraft and Personnel (TRAP) to recover a damaged CH-46E and lift it back to the USS *Wasp*.³⁰ This is listed as the third task the CH-53E will perform according to the CH-53E TACMAN and it is the only aircraft capable of performing this Herculean feat. The CH-53E was utilized for what it was originally designed to do, lift large equipment and transport it to the shore, or in this case back to the ship.

²⁹ Pike, Op Eastern.

³⁰ HMM-263 (REIN) Command Chronology: 1 January through 30 June 1993.

Bosnia

On 8 June 1995 the 24th MEU (SOC) was called upon to conduct a TRAP in hostile territory which would put the Marine Corps in the annals of US military history. A package of aircraft was launched to recover Air Force Captain Scott O'Grady who had been shot down five days earlier by a SA-6. The TRAP package, two CH-53Es escorted by two AH-1Ws, was launched in the predawn hours and covered over 75 miles through enemy held territory to snatch Captain O'Grady out from under the noses of the Serbian Army. The whole package recovered back aboard to the USS *Kearsarge* safely with only minor damage due to enemy fire.

Once again the capabilities of the CH-53E were exploited to conduct a successful mission. Had the MV-22B been operational at this time it would have been the aircraft of choice due to its range and speed, making it a more survivable platform for this mission. Due to the range of the mission and the number of passengers that needed to be transported for the security element, the CH-46E was again out of its capabilities window.

Afghanistan

The CH-53E has recently seen action in Afghanistan during Operation ENDURING FREEDOM and was the workhorse of the war conducted far inland, in a hostile desert environment, against al-Qaida and the Taliban. On 20 October 2001 two CH-53Es of the 15th MEU (SOC) conducted a TRAP of a UH-60 helicopter that had

crashed in Pakistan during a rescue mission of Army personnel.³¹ Because of the distance involved in the recovery mission, it was necessary for the two CH-53Es to aerial refuel from a KC-130 and the two AH-1Ws to be refueled at a FARP by a Tactical Bulk Fuel Delivery System (TBFDS) carried internally in one of the two CH-53Es. During the extraction of the UH-60, the CH-53Es were fired upon by unknown forces and after returning limited fire had to abort the mission.³² Four days later the Super Stallions would return to finish the recovery effort of the UH-60 Blackhawk and transport it externally to the USS *Kitty Hawk* in the Arabian Sea.³³

“Thirty days after the successful TRAP mission in Pakistan . . . [T]he 26th MEU (SOC) and the 15th MEU (SOC) were combined into Task Force 58 . . . [A]nd on 25 November 2001 kicked in the Taliban’s back door in Afghanistan.”³⁴ The longest helicopter raid in Marine Corps history took place when six CH-53Es launched from Task Force 58 aboard amphibious shipping and successfully executed an astoundingly difficult mission. The initial raiding force was conducted with six CH-53Es loaded with combat troops and equipment, which launched off the USS *Peleliu* in the Arabian Sea, flying more than 400 miles with one aerial refueling evolution to insert the Marine Corps assault force.³⁵

“This was . . . [B]elieved to be the largest, longest range, inland assault by the Marine Corps in nearly a century.”³⁶ Although C-130 Hercules transport planes and CH-46Es contributed to the subsequent buildup of forces ashore, none of this could have been

³¹ Gordon Lubold, “Marine Take Fire in Recovery Effort,” *Marine Corps Times* (November 5, 2001):3.

³² Laurence McQuillan and Andrea Stone, “Mystery Attackers Fire at U.S. Forces in Pakistan,” *USA Today*, 24 October 2001, 7.

³³ Cesar G. Soriano, “Elite Marine Unit Makes First Strikes On Taliban,” *USA Today*, 5 November 2001, 6.

³⁴ Mark C. Brinkley, “Our Turn,” *Marine Corps Times*, 10 December 2001, 12.

³⁵ Brinkley, “Our Turn,” 12.

³⁶ *Ibid*, 12.

accomplished without the capabilities of the CH-53E. Like the lighter Army Chinook, the three engine, seven-bladed CH-53E never was designed as an air assault platform, but its payload and range have made it an asset in the Central Asian conflict.³⁷ This was a real issue during the Marines' stay at Camp Rhino in Afghanistan. Getting beans, bullets, and bandages to Marines on the ground initially was made more difficult because supplies had to be flown in aboard CH-53E Super Stallion heavy lift helicopters or KC-130 Hercules refueler planes. Marines could not bring in their 155mm howitzers to the fight because the artillery pieces could not be flown in.³⁸ The lack of a truly heavy-lift helicopter was brought to the foreground with this dilemma. "The CH-53E did not have the required power to lift the . . . 15,740 pound M198 howitzer . . . [T]o Kandahar from amphibious shipping."³⁹ Due to the high altitudes at which the CH-53Es had to fly they did not have the required power available to carry the heavy loads to where the Marines were located.

According to current and future Marine Corps doctrine all of the missions except for the artillery movement should have been accomplished by Marine Corps medium-lift. The situation in Afghanistan points to the need for the MV-22B to be operational to lift troops to the "hot" landing zone and it emphasizes the need for a more robust heavy-lift helicopter to lift the Marine Corps heavy equipment. Again initial assaults were not designed to be conducted by the CH-53E, but the fact remains that the Super Stallion is still the MAGTF commander's most capable and versatile aviation asset.

³⁷ Colucci, 34.

³⁸ Gordon Lubold, "Lesson Learned," *Marine Corps Times*, 9 September 2002, 24.

³⁹ CH-53E TACMAN, C-4.

Chapter 5 – The Future of Heavy-Lift in the 21st Century

The Marine Corps' vision for future operations is defined in Marine Corps Strategy 21 and its capstone operational concept, EMW.⁴⁰ Assault support in this maneuver concept needs to accomplish rapid, flexible maneuver to achieve an advantage over the enemy. Assault support provides that capability by providing tactical mobility and logistical support to the MAGTF. Assault support contributes primarily to two warfighting functions: maneuver and logistics.⁴¹ The CH-53X will be an integral part of this plan because the Marine Corps is not getting light enough for the MV-22B to do all the movement of supplies and equipment. Marine aviation continues to execute the assault support aircraft neck-down strategy that was first implemented over a decade ago.⁴² The neck-down strategy involves the Marine Corps moving from five different types of helicopters to four. Eventually the Marine Corps will rely on just three helicopters. The revolution in Marine aviation will be the MV-22B and its tilt rotor technology. This aircraft will all but eliminate the shortfall in medium-lift requirements and enable the Marines to cover 10 times more area than they are currently capable of. The MV-22B will become the primary troop transport of the future thus relieving the CH-53 of its adopted duties of troop transport.

A study by the Center for Naval Analysis (CNA) stated:

The MEU (SOC) will continue to have heavy equipment, which the MV-22 cannot transport. It makes sense to continue to include some heavy-lift transport capability (CH-53Es) in the MEU ACE.⁴³

⁴⁰ LtGen William L. Nyland (USMC), "State Of Marine Aviation," *Marine Corps Gazette*, May 2002, 20.

⁴¹ AIP 00-01, A-4.

⁴² Nyland, 20.

⁴³ HQMCDA MEU, 8.

The rotary wing lift associated with each MEU in the future will consist of at least 12 MV-22Bs and 4 CH-53Xs. Most studies find that it should really be 14 and 6, respectively, to provide the Marine commander the appropriate lift. Based on CNA's analysis, the Marine Corps should pursue the CH-53E modernization program to provide capable lift of LAVs and LW 155 howitzers in future operating environments.⁴⁴

CH-53X

The CH-53X will come from what is currently the CH-53E after its Service Life Extension Program (SLEP) or remanufacture. The average age of the Marine Corps CH-53E fleet is 13 years old, with an average of 2,979 hours on the airframe. The first CH-53E was officially retired January 17, 2002.⁴⁵ Of the 161 CH-53Es in the Marine Corps, 137 have an average of 3,287 hours and an average utilization rate of 15.4 hours a month and will need to be retired within the next 15 years.⁴⁶ The current limitation on the airframe is the tail pylon which is limited to 6,120 hours.⁴⁷ Currently a bell shaped curve for retirements, the biggest impact will start in the 2011 time frame when an average of 13 aircraft a year are retired for the following 10 years as depicted in figure 1.

⁴⁴ HQMCDA MEU, 14.

⁴⁵ Bonholtzer, 6

⁴⁶ Information provided via e-mail from HQMC Department of Aviation Officer that preferred to remain anonymous.

⁴⁷ John R. Guardiano, "CH-53E Service Life Extension Program (SLEP): FY02 Budget Appropriation: \$18.8 Million," *Rotor & Wing*, February 2002, 9.

CH-53E Retirement Schedule (Based Upon Fatigue Life Limits) Aircraft per Year

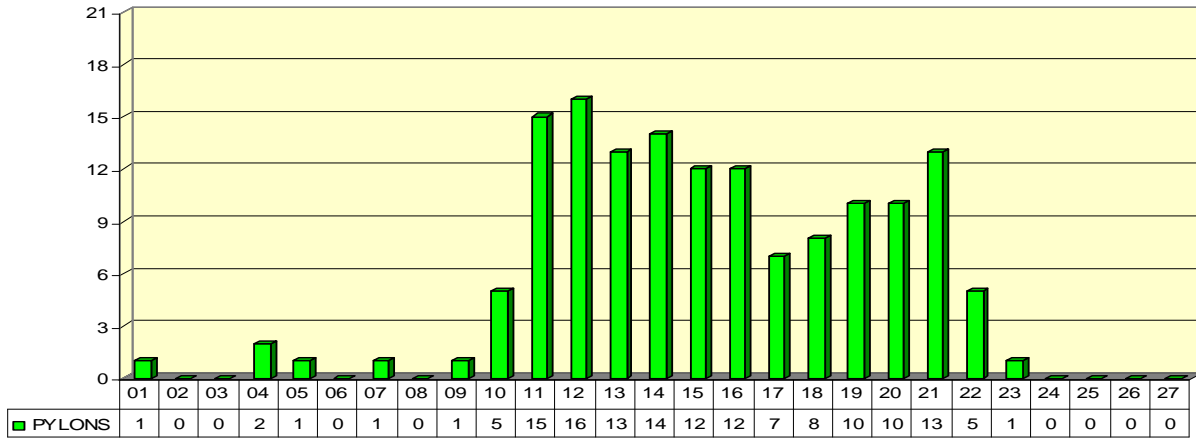


Figure 1⁴⁸

The mission requirements for the new heavy-lift helicopter for the Marine Corps will be much greater than that of the CH-53E. According to the CNA report, the next CH-53 will have to operate at 3,000 feet mean sea level (MSL) on a 91.5 degree Fahrenheit day. Under those conditions, the MV-22B and CH-53E can currently lift a maximum of 9,000 and 12,000 pounds respectively, at a ship-to-shore distance of 85 NM.⁴⁹ This was the requirement studied for a Major Theater War (MTW) moving a regimental landing team from ship to shore and also around the battlefield. The study did not even take in account the moving of Light Armored vehicles (LAV), M777s (new lightweight 155mm howitzers), the prime movers (MTVR), or even the High Mobility Artillery Rocket System (HIMARS).

⁴⁸ Jim Garman, *CH-53E Modernization*, Sikorsky Aircraft Corporation, July 2001, 9.

⁴⁹ Headquarters Marine Corps Department of Aviation, "Executive Summary," *2001 CNA Marine Aviation Requirements Study*, 2 December 2002, URL: <http://hqinet001.hqmc.mil/avn/documents/acplan2002.pdf>, accessed 11 January 2003. Cited hereafter as HQMCDA Summary.

In the Marine Corps Vision 21 and the CNA brief there is a need for heavy-lift in the MEU and also in any other MAGTF function. The CH-53X is the aircraft that will meet and exceed these requirements, the ability to lift 28,000 pounds at 3,000 feet mean sea level and 91.5 degrees Fahrenheit, for Vision 21 and also be an enabler for STOM. The result will be a totally remanufactured Super Stallion, designated the CH-53X, which will be restored to a “like new” condition.⁵⁰

Several improvements already were requested by former Deputy Commandant for Marine Corps Aviation LtGen Fred McCorkle. These include a new center fuselage, transition section and tail-boom with structural enhancements that could increase gross weight from 73,500 to 78,500 pounds.⁵¹

The Marine Corps is looking at these new heavy-lift aircraft being able to carry the 28,000 pound LAV a distance of 150 NM on a 91 degree Fahrenheit day at a mean sea level of 3,000 feet. Currently the CH-53E can only carry about 7,500 pounds that distance.⁵²

The most important improvement to the CH-53 will be the replacement of the tail pylon area and cabin sections around the main transmission. The new strength added in the airframe will allow an additional 5,000 pounds of payload to be carried externally. Currently the tail pylons are the limiting factor in the airframe itself. During a one month time frame HMMH-464 had to replace tail pylons on two aircraft in order to keep those aircraft flying.⁵³ Currently there are no longer any spare tail pylons in the inventory and it is cost prohibitive to build only new tail pylons. This band-aid approach will only temporarily fix a symptom of a much larger problem involving the transition section and

⁵⁰ Bonholtzer, 3.

⁵¹ Colucci, 22.

⁵² Ibid, 23.

⁵³ Author's own experience in 1995 while assigned to HMM-162 (REIN).

tail pylon. Figure 2 depicts the two areas in which the airframe will be newly manufactured. The aft section is the new transition section of the tail pylon and the middle section is the new cabin section under the main gear box area.

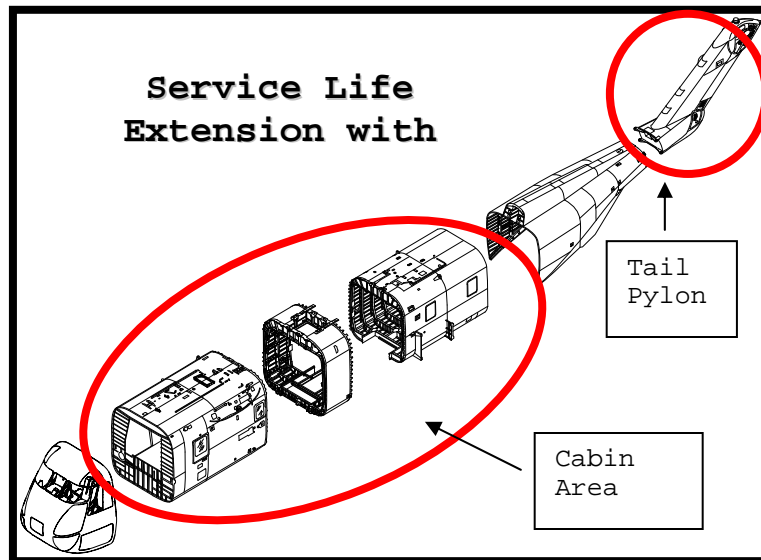


Figure 2⁵⁴

In order for the next CH-53 to accomplish the missions called for in the CNA analysis a significant improvement to the engine performance must be made. The plans call for the General Electric T64-416 and General Electric T64-416A engines currently installed in the CH-53E to be replaced with Rolls-Royce Allison AE1107C engines that are already installed in the MV-22 and C-130J aircraft.⁵⁵ These new engines in the CH-53X will increase the shaft horsepower from the current 4,380 shaft horsepower to 6,150 shaft horsepower.⁵⁶ The current main gear box transmission in the CH-53E has room to accommodate the growth of these engines. These improved engines will be a leap in technology from the old mechanically operated engines currently installed in the CH-53E. The old engines are controlled manually by the pilots through Speed Control

⁵⁴ Garman, 11.

⁵⁵ Bonholtzer, 5.

⁵⁶ Colucci, 36.

Levers (SCL) in the cockpit overhead and increase the pilot workload. Currently pilots must adjust the SCLs during takeoff and during external lifts of equipment. The new engines will be controlled through an Electronic Control Unit (ECU) on each engine much like the engines on the UH-60 Blackhawk, thus reducing the pilot workload. The SCLs on the Blackhawk are kept in the fly detent and do not need to be adjusted.

The new engines will save significant amounts of money in the total life cycle of the new aircraft - \$258 per flight hour.⁵⁷ Most of the savings would come from contract maintenance based on performance parameters instead of purely on engine hours. Currently maintenance is conducted on an hourly schedule, the new engines would now be maintained based upon engine parameters: engine temperatures, gas turbine speeds, and torque. Maintenance would be conducted only when the engine requires it instead of an hours based schedule. Since the MV-22 has the same engines that would go into the CH-53X, this would reduce any testing and evaluation costs. These new engines would give commonality to the KC-130J, MV-22B, and CH-53E and more importantly, give the Navy aviation supply ships only one type of engine to have on hand for two different types of aircraft based aboard amphibious ships, the MV-22B and the CH-53X.

The current CH-53E uses what is called a “wet” head design using standard bearings and hydraulic dampers. This is a very maintenance intensive system and is very expensive to maintain. The CH-53D currently uses a “dry” head which decreases the amount of maintenance that needs to be completed after each flight. The CH-53X will incorporate a new rotor system consisting of an elastomeric rotor head which has elastomeric bearings, a failsafe hub structure built of titanium, on-condition maintenance, improved dampers, and electric blade fold which will eliminate all the expensive and

⁵⁷ Douglas W. Nelms, “Marine Aviation,” *Rotor & Wing*, June 2002, 9.

time consuming maintenance now performed on the rotor head.⁵⁸ This system will have a cost savings of \$352 per flight hour.⁵⁹ It is a proven system used on all UH-60 Blackhawks and CH-60 Seahawks so it would not be an experimental design concept.

The new rotor blade that is being considered for the CH-53X is a fully composite rotor blade eliminating the maintenance intensive pressurized titanium spar that runs the length of the blade and the honeycomb structure behind the spar. The anhedral tip design would provide an additional 4,000 to 6,000 pounds of lift and also reduce the speed at which blade stall occurs, thus allowing for faster airspeeds.⁶⁰ This type of blade is currently being used on the S-92 and would save \$283 per flight hour.⁶¹ This will eliminate some of the time consuming maintenance manpower committed to checking the blade pressure and integrity. Figure 3 depicts the new anhedral tip blades on a Sikorsky S-92 helicopter.



Figure 3⁶²

The new cockpit that will be installed on the CH-53X will be incorporated from the 'glass cockpits' of the AH-1Z, UH-1Y, and C-130J. This will significantly reduce the

⁵⁸ Bonholtzer, 6.

⁵⁹ Garman, 20.

⁶⁰ Ibid, 15.

⁶¹ Ibid, 15.

⁶² Ibid, 15.

workload of the pilots and also create more space to grow with future avionics gear.⁶³

The new cockpit will also provide better visibility for the pilots because the glass display panel will reduce the size of the current display panel dramatically. The current display panel obscures a vast majority of both pilots' views during the landing phase due to the nose high landing attitude. The new cockpit will allow 25 percent more view on each side of the display panel and will mitigate the risk with the pilots trying to look around the current panel during landing.

In the cockpit upgrade there is a new FLIR that is incorporated to correct for the current supply difficulties of the old, off the shelf FLIR. The current FLIR is no longer manufactured and replacement parts are difficult to acquire. The new FLIR will more than likely be the same as the MV-22 easing the supply difficulty. The CH-53X will have a truly night and adverse weather capability that will allow Marines to launch when the enemy does not expect it. The cost savings by necking down to one cockpit system for four aircraft will be beneficial to the Marine Corps during the current constrained budget times. The cost to the CH-53X will be reduced by \$41 a flight hour because of the commonality.⁶⁴

The cargo handling system in the CH-53X will be vastly improved over the current CH-53E. Based on 1970's technology, the current system is very manpower intensive and is subject to many inadvertent releases of cargo by mechanical and electrical glitches in the design. The new system will allow one man movement of internal cargo with winch assist and a more reliable cargo hook and pendant system. The system will reduce the number of switches and electrical connections which will

⁶³ John Pike, "CH-53X Super Stallion Remanufacture," 18 July 2002, URL: <<http://www.globalsecurity.org/military/systems/aircraft/ch-53x.htm>>, accessed 23 October 2002.

⁶⁴ Bonholtzer, 6.

eliminate the ‘stray’ electron issue which is the primary cause of inadvertent load releases. The cargo system will be reinforced to handle the additional weight that is expected to be carried externally and it will eliminate the mechanical linkages which is also maintenance intensive.⁶⁵

The overall cost savings of the CH-53X will be dramatic. The cost of maintaining the CH-53X will be 25 percent less than maintaining the current CH-53E.⁶⁶ The aircraft will cost 21 million dollars to rebuild which (a fifth of the cost of a new CH-53E) and the new components (engines, blades, rotor head) will save 30 million dollars a year on maintenance.⁶⁷ “The result of the program . . . [W]ill be a fully modernized aircraft returned to the fleet with zero accumulated flight time and 6,500 flight hours remaining.”⁶⁸ The completion of this program will be the complete transformation of Marine aviation with new platforms to include the UH-1Y, AH-1Z, MV-22B, KC-130J, and the Joint Strike Fighter (JSF). “The Marine Corps will no longer need to . . . [E]xhaust all reasonable means to extend the service life of our legacy equipment.”⁶⁹

Capabilities of the CH-53X

The modernized CH-53X will add even more capability to OMFTS than is being planned for today and will be able to lift three times that of the current CH-53E.⁷⁰ It will be able to lift a 28,000 pound LAV at 3,000 ft MSL on a 91.5 degree Fahrenheit day and

⁶⁵ Garman, 19.

⁶⁶ Guardiano, 9.

⁶⁷ Pike, CH-53X Super Stallion Remanufacture.

⁶⁸ Nyland, 21.

⁶⁹ Gen James L. Jones, USMC, speech presented at the Senate Armed Services Committee concerning readiness, Washington, DC, 27 September 2000.

⁷⁰ Pike, CH-53X Super Stallion Remanufacture.

transport it 200 NM and return to amphibious shipping without refueling.⁷¹ This will increase Marine mobility and firepower ten times what it is now. Transport of the lightweight howitzer will improve dramatically as well. The CH-53X will be able to lift the M777 howitzer, nine tons of ammo, and its crew 250 NM.⁷² The improved lifting capacity due to the new engines, rotor blades, and reinforced fuselage will increase the airborne gross weight from 73,500 pounds to an astounding 78,500 pounds.⁷³

The likelihood of the MV-22B being able to support the demands of the assault support missions and logistics support missions for Marine forces employing over the horizon concepts is slim at best.⁷⁴ The CH-53X will be the platform that makes up for the hole in logistics made by the MV-22Bs deeper maneuver capability. Figure 4 shows the difference in lift capabilities with different combinations of engines and blades. The bottom set of lines show current capabilities in relation to the amount of payload carried for certain distances. The middle set of lines shows the increase of those same capabilities with just the new engines. The top set of lines shows the vastly improved capabilities with new engines and blades.

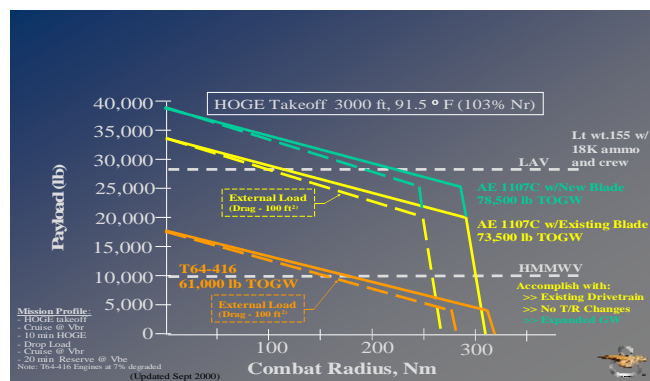


Figure 4⁷⁵

⁷¹ Garman, 22.

⁷² Ibid, 23.

⁷³ Ibid, 23.

⁷⁴ LtCol Adrian W. Burke, "The Creation of the Seabase," *Marine Corps Gazette*, September 2002, 84.

⁷⁵ Garman, 21.

Lift Capabilities The lift capabilities of the CH-53X will need to be considerably more than that of the current CH-53E. Under new logistic support concepts, the CH-53 can be expected to take on a greater role moving supplies directly to ground combat forces.⁷⁶ Lessons learned from a MAWTS-1 study of the 21st century Maneuver Warfare found that the Marine Corps is actually getting heavier and not lighter. It also found that funding for the SLEP of the CH-53E is required to ensure the Marine Corps maintains a heavy external lift capability for 2010 and beyond.

The lack of lift capacity took its toll in the conflict in Afghanistan because the M198 howitzer was too heavy to be flown the distance required. The CH-53X will eliminate this with the capacity to take the howitzer, its crew, and ammo 200 nautical miles from the ship and put them where they are needed. The MV-22B will only be able to carry the 9,000 pound M777 50 nautical miles.⁷⁷ This load that will be carried does not include any ammunition or crew. This differential in distance between the fire support and the Marines put inland with the MV-22B would be too great.

The CH-53X will be able to lift the new MTVR, which weighs approximately 27,742 pounds, inland 200 nautical miles so that the M777 will have a prime mover to move it around on the battlefield. This will eliminate the need for the movement by helicopter after the howitzer's original insertion and will allow the crew to be highly mobile. The only limitation on lifting the MTVR will be the truck itself- most trucks are not capable of being lifted because of their structure. The High Mobility Artillery Rocket System (HIMARS), which weighs 30,131 pounds fully armed, will also be able to be

⁷⁶ BGen Bruce B. Byrum USMC, "Marine Corps Aviation: The Other Perspective," *The Hook Magazine*, Fall 1998, URL: <<http://www.tailhook.org/Fa98Brf.htm>>

⁷⁷ MV-22 Facts

transported 175 nautical miles.⁷⁸ The LAV would also be able to be carried externally out to a range of 200 nautical miles and would complement the HIMARS and make for a mobile force combined with the troops put on the ground with the Osprey.

The logistical requirements of the Marines will be incredible as well. Sustaining deeply inserted vertical assault forces from a seabase presents a critical challenge. The absence of dumps ashore, limited resupply delivery means, and rapidly maneuvering combat forces will require total asset availability to supply those forces.⁷⁹ The study conducted by MAWTS-1 on OMFTS showed that the logistical footprint of a MEB will be extremely large and if a deep water port or an acceptable beach for AAVs or LCACs is not available, the sustainability of the Marines ashore will depend on vertical lift. This means the CH-53 and MV-22 will be critical in the sustainment of Marine ashore. The study concluded that the Marine Corps is indeed getting heavier along with the logistical demands of ship-to-objective movement. The CH-53X will be able to meet most of these needs. It will be able to lift all but the most extremely heavy equipment like the M1A1 main battle tank and AAV.

Forward Arming and Refueling Point (FARP) A critical advantage of the CH-53X will be the ability to carry the tactical bulk fuel delivery system (TBFDS). This system consists of three 800 gallon ballistic reinforced tanks that are carried within the aircraft that can be used as a mobile FARP. This will give great mobility to armored forces enabling them to have fuel on call from overhead CH-53Xs. These helicopters will be able to land in austere environments and provide 2,400 gallons of fuel from the tanks and

⁷⁸ Christopher F. Foss, "Armour and Artillery," *Janes* (Surrey, UK: Sentinel House, 2001-2002) 829.

⁷⁹ Marine Corps Combat Development Command, "Ship-To-Objective Maneuver, *USMC Concept Paper*, 23 July 1997.

another 1,300 gallons from the CH-53X's own auxiliary tanks for a total of 3,700 gallons of fuel.

Establishment of MAGTF FARPs to support rotary wing attack and ground forces will be required to support units operating at extended distances.⁸⁰ With the TBFDS, Marine AH-1 and UH-1 aircraft will be able to go the same distances as the MV-22 to support the troops on the ground with on-call fire support. This system was used to bring escort aircraft into the Sarajevo airport from the Adriatic Sea in 1996. The entire refueling evolution, to include set up, de-arming the escorts, taxiing, fueling, rearming, and break down took less than 25 minutes.⁸¹ This system also played a crucial role in the retrieval of an Army UH-60 in Afghanistan as mentioned earlier. Figure 5 shows two AH-1Ws from the 24th MEU (SOC) refueling with a TBFDS in a remote part of Egypt during BRIGHT STAR 1997.



Figure 5

⁸⁰ Marine Aviation Weapons and Tactics Squadron 1, "MAWTS-1 OMFTS Study," 5 May 2000, 44.

⁸¹ Captain David J. Dowling, USMC, "Tactical Bulk Fuel Delivery System: Experience From the Field," *Marine Corps Gazette*, January 1997, 50.

This system is not just utilized for aviation assets. Joint Vision 2010 states aviation elements must be prepared to operate ashore in an expeditionary mode to ensure responsiveness to maneuvering ground forces.⁸² Using the TBFDS the CH-53X would be able to fuel armored vehicles as well as motor transportation for ground combat units. One CH-53X using the TBFDS would be able to fuel seven M1A2 tanks or nine AAVs. The CH-53X could then take off and aerial refuel from a waiting C-130J and start the process all over again. This would allow a ground commander an extreme advantage to continue pressing the enemy while not having to worry about his traditional supply convoys that are trailing behind the advancing forces. The employment of the TBFDS would eliminate some the traditional FARPs that consist of fuel bladders, pumps, hoses and ground personnel. This set up is more vulnerable to hostile forces than the TBFDS due to the lack of mobility of the traditional FARP.

⁸² F. G. Hoffman, "Joint Vision 2010 – A Marine Perspective," *Joint Forces Quarterly*, Autumn/Winter 1997-98, 34.

Chapter 6 – Conclusion

Summary

This study addressed current heavy-lift in the United States Marine Corps and where it will go in the 21st century. The Marine Corps' history of heavy-lift started in Vietnam and continues today. From Operation EAGLE CLAW to the Gulf War in 1991 to the current Operation ENDURING FREEDOM, the CH-53 has proven itself as the heavy lifter of the Marine Corps. It provides logistical support to the Marine on the ground and is critical to combat efforts ashore. The Marine Corps requires that it maintain a heavy-lift capability to ensure the accomplishment of OMFTS. Since the Marine Corps operates in austere environments it is a necessity that the Marines on the ground are capable of being supplied even if landing those supplies across the beach is not an option. Providing logistics support over a great distance will demand more from Marine Corps heavy-lift assets.

This study focused on how heavy-lift in the Marine Corps has evolved over the years in terms of aircraft as well as how some of its missions have changed. It is critical for heavy-lift to be available in order to support the Marine Corps warfighting doctrine in the 21st century. The study showed the need for an improved heavy-lift aircraft to keep pace with the growing weight of the Marine Corps as well as the distances involved in moving the very same equipment. This study concludes with a discussion of how the CH-53X will meet those challenges of the 21st century and provide the United States Marine Corps the lift it requires to accomplish the mission.

Conclusion

An integral part of OMFTS, EMW, and STOM is that these concepts all rely on seabasing as the step off point. Seabasing allows the Navy and Marine Corps team not to be reliant on host nation support in order to take action in a region. OMFTS implies a much heavier reliance on transportation assets, particularly rotary wing and tiltrotor aircraft. It requires a much greater allocation of available air assets to logistics missions than Marines are used to.⁸³ There are large holes in several OMFTS models that have been studied and it is unlikely that MV-22 will be able to make up the difference. The MV-22 was not designed with the primary intention of being a logistics support aircraft. Lift and load capabilities were sacrificed for speed and reach.⁸⁴ The CH-53X will be the aircraft that will make up the difference in lift. The current CH-53E cannot lift the equipment the distance required under the environmental demands in future operations.

Modernization of the CH-53E will pay enormous dividends in terms of improved tactical flexibility and effectiveness of air assault forces without increasing numbers of aircraft.⁸⁵ It will be necessary to modernize the CH-53E to the CH-53X configuration in order to meet the demands of future warfighting environments. The Marine Corps must be able to support logistically the troops that are displaced further away from their point of origin, the seabase. The cost of not modernizing the CH-53 will be troops without proper level of logistical support and in the long run, mission failure. The Marine Corps owes the Marines on the ground the required support needed to operate in the EMW environment.

⁸³ Burke, 84.

⁸⁴ Ibid, 84.

⁸⁵ HQMCDA Summary, 6.

Seabasing will be the future platform of how the Navy and Marine Corps initiates the fight from and with this concept vertical lift will be cornerstone of the logistics framework. The MV-22 and CH-53 will be required to supply troops ashore providing them with the means to continue to take the fight to the enemy. The burden of this support will fall mightily on the CH-53 aircraft and of what it does and fails to do. Heavy-lift in the Marine Corps will be extremely crucial in the 21st century and it will be accomplished with the CH-53X.

Based on the research and assessment in this paper, it is evident that the CH-53X will be crucial in the 21st century. It will bring a robust logistics capability to the Marine Air Ground Task Force Commander enabling him to ensure his Marines have the proper equipment and supplies to wage this country's battles. Heavy-lift will be the cornerstone in the Marine Corps future warfighting plan. Without logistical support a combat force will be unable to continue the fight and will eventually lose the battle. The CH-53X will bring the necessary heavy-lift capabilities to the battlefield.

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